PCAN-GPRS Link

Platform for Telematic Applications

User Manual

Document version 1.1.2 (2014-05-12)

Products taken into account

Product Name	Model	Item Number
PCAN-GPRS Link		IPEH-004000
PCAN-GPRS Link Set	evaluation version	IPEH-004000-EVAL

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1 Introduction

PCAN-GPRS Link is a hardware and firmware platform for the recording and forwarding of vehicle data. There are two freely programmable microcontrollers within the unit which process internal vehicle data.

The PCAN-GPRS Link is provided as a development platform for telematic applications. An API allows simple integration within a specific application environment. The PCAN-GPRS Link supports the evaluation of FMS and Bus FMS data (Fleet Management Standard). This produces consumption-related vehicle data. The DTCO info interface also allows the connection and processing of a digital tacho with access to information such as driver identification and driver working time. The GPS module can be used to determine location and output the direction of travel.

The PCAN-GPRS Link has ECE type approval (E1), which guarantees its problem–free use in vehicles.

1.1 Properties of a Glance

- Dualcore ARM7 (core) and ARM9 (GPRS) system
- U-blox 5 GPS module with 50 channels and over 1 Million correlators. Position accuracy 2.5 m CEP at -130 dBm
- Data transfer via GPRS or CSD
- Wavecom GPRS class 10 quad-band modem
- Handling of DTCO and FMS data
- Handling of OBD-2 data via CAN (complete PID support not ensured)
- Support for the PCAN-Link software package by PEAK-System
- Two High-speed CAN channels (ISO 11898-2) with bit rates of 40 kbit/s to 1 Mbit/s
- Wake-up function
  - via CAN
  - via clamp 15 (ignition)
- Two digital inputs
  - Low- or High-active (depending on the circuit Pull-up/ -down)
- One digital output
  - Low-side driver (BSP75)
  - Maximum inverse voltage 40 V
  - Output current 500 mA
- One UART V.24
- DTCO (digital tacho) with input level 0 - 9 V DC
- Recording of all data to internal flash memory (maximum 2 GB)
- Firmware update via GPRS

- 5 individual extension pins (on the automotive connector)
- 6 dual LEDs free configurable, 1 LED fixed function (GPRS modem)
- E1 type approval
- Operating voltage: 6 – 32 V DC
- Extended operating temperature range from -40 to 85 °C (-40 to 185 °F)

1.2 Prerequisites for Operation

- Operating voltage: 6 - 32 V DC
- FAKRA GSM/GPS combination antenna
- For programming
  - Windows 8, 7, Vista, XP, 2000
  - SD card reader
  - ARM Evaluation Software µVision from Keil (www.keil.com/demo/eval/arm.htm)
- For the demo server
  - Linux server with root rights
  - MySQL Server version 5 or higher
  - MySQL connector C++ version 1.0.5 or higher
  - Xerces XML Parser 2.8 or higher

1.3 Scope of Supply

PCAN-GPRS Link Set:

- PCAN-GPRS Link in aluminum casing
- Preconfigured cable set
- 1 GB memory card installed
- JTAG adapter
- Additional set of crimp contacts
- GPRS/GPS combination antenna
- CD with library, programming example and manual in PDF format

PCAN-GPRS Link:

- PCAN-GPRS Link in aluminum casing
- Tyco mating connector including crimp contacts
- CD with library, programming example and manual in PDF format

2 Hardware

Description of the hardware module.

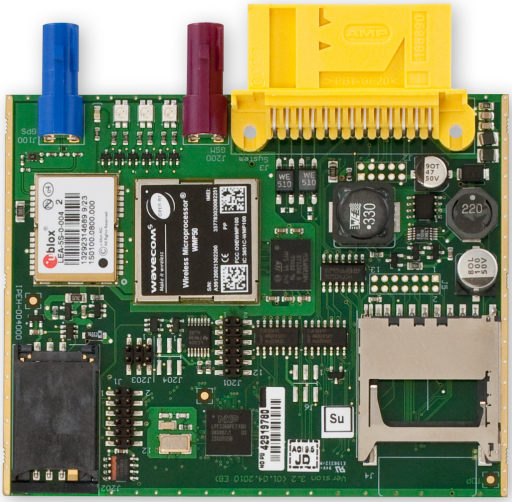


Figure 1: Arrangement of the hardware on the board

2.1 Pin Assignment Automotive Connector

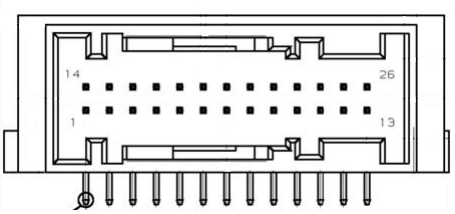


Figure 2: Arrangement of the pins on the automotive connector

Pin	Function	Pin	Function
1	Power supply (6 - 32 V)	14	Power supply (6 - 32 V)
2	GND	15	GND
3	For extension J2:10	16	For extension J2:7
4	For extension J2: 6	17	For extension J2:8
5	Clamp 15 (ignition)	18	For extension J2:4
6	Digital IN 1	19	UART CTS (Software)
7	Digital IN 0	20	UART RTS (Software)
8	Digital OUT	21	UART TxD
9	DTCO TxD	22	UART RxD
10	CAN 0 Low	23	CAN 0 Low
11	CAN 0 High	24	CAN 0 High
12	CAN 1 Low (FMS)	25	CAN 1 Low (FMS)
13	CAN 1 High (FMS)	26	CAN 1 High (FMS)

2.2 Microcontroller LPC2368

Basics	
ARM 7	72 MHz
RTC	32,768 kHz
Flash	512 Kbyte
SRAM	32 Kbyte

2.3 GPS-Module u-blox LEA-5S

Basics	
Sensitivity	-160 dBm (SuperSense)
Receiver	50 channels with over 1 Million correlators
Accuracy	2,5 m CEP at -130 dBm
DGPS	SBAS (WAAS, EGNOS, MSAS, GAGAN) 2,0 m CEP at -130 dBm

Time To First Fix (TTFF)	
Hot Start (Autonomous)	< 1 s
Warm Start (Autonomous)	29 s
Cold Start (Autonomous)	29 s

Antenna	
Antenna feeder	3,3 V, maximum 50 mA
Minimum gain	15 - 20 dB
Maximum noise figure	1,5 dB
Maximum gain	50 dB
Impedance	50 Ω
Connector	FAKRA Code C

2.4 GPRS-Module Wavecom Wireless CPU WMP50

Basics	
Data transfer	GPRS Class 10
Transmission power	1 W at 1800/1900 MHz 2 W at 900/800 MHz
Modem type	Quad band 800/900/1800/1900 MHz
ARM9	26 MHz (optional: WMP100 with 104 MHz)

Antenna	
VSWR max.	1,5:1
Impedance	50 Ω
Typical radiated gain	0 dBi
Connector	FAKRA Code D

2.5 Extension

It is possible to extend the hardware using two pin headers. Following pins on these pin header are available:

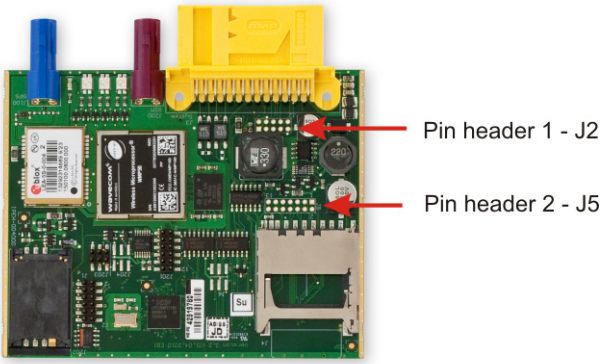


Figure 3: Pin header 1 - J2, pin header 2 - J5

2.5.1 Pin Header 1 – J2

Pin	Function	Pin	Function
1	Supply voltage, maximum 500 mA	6	Extension (Pin 4 automotive connector)
2	RESERVED	7	Extension (Pin 16 automotive connector)
3	3,3 V maximum 100 mA	8	Extension (Pin 17 automotive connector)
4	Extension (Pin 18 automotive connector)	9	GND
5	5 V, maximum 500 mA	10	Extension (Pin 3 automotive connector)

2.5.2 Pin Header 2 – J5

Pin	Function	Pin	Function
1	Global reset (Low-active)	8	Extension microcontroller: P0.15 (P0[15], TXD1, SCK0 (SSP0), SCK (SPI))
2	Start microcontroller with internal boot loader	9	3,3 V, maximum 100 mA
3	Extension microcontroller: P0.26 (P0[26], AD0[3], AOUT, RXD3)	10	GND
4	Extension microcontroller: P0.18 (P0[18], DCD1, MOSI0 (SSP0), MOSI (SPI))	11	UART 3 microcontroller Software CTS
5	Module Identification microcontroller: P0.23 (P0[23], AD0[0], I2SRX_CLK, CAP3[0])	12	UART 3 microcontroller Software RTS
6	Extension microcontroller: P0.17 (P0[17], CTS1, MISO0 (SSP0), MISO (SPI))	13	UART 3 microcontroller TxD
7	Extension microcontroller: P0.16 (P0[16], RXD1, SSEL0 (SSP0), SSEL (SPI))	14	UART 3 microcontroller RxD

2.6 SD Card

The SD card is located in the card slot on the board of the PCAN-GPRS Link. To format the SD card and/or to install the firmware, you need an SD card reader and an SD card with maximum 2 GB capacity (supplied with the PCAN-GPRS Link set is a 1 GB SD card).

Do the following to setup and/or install the SD card:

1. Unscrew the back panel of the PCAN-GPRS Link.
2. Press the SD card at its end to eject it from the card slot.
3. Insert the card into the card reader on the computer.
4. Format the card and/or copy the firmware onto it (see also *on page 34 Uploading the Firmware via SD Card*).

   Format the SD card with the file system **FAT16** or **FAT32** through the appropriate application of the operating system (maximum sector size 512 byte).
5. Log off the SD card from the Computer and take the card from the card reader.
6. Insert the SD card back into the card slot.
7. Close the back panel of the PCAN-GPRS Link.

3 Operation

The power supply of the PCAN-GPRS Link is switched on by applying the supply voltage. To save power it is possible to switch off the internal power supply. Restart is only possible via CAN or clamp 15 (ignition). The RTC from the microcontroller and the GPS are still supplied. This allows a fast GPS Fix.

Attention! The GSM antenna must always be connected! If this is not the case, the transmitter can be damaged.

3.1 Status LEDs

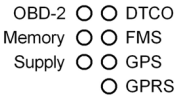


Figure 4: Layout of the LEDs on the PCAN-GPRS Link

LED	Status	Meaning
Supply	Green blinking	Supply voltage available
GPRS	Green static	Modem ready
	Green blinking	GPRS connection established
GPS	Red blinking	Waiting for valid NEMA data (during GPS receiver initialization)
	Green blinking	GPS receiver ready, forwarding valid NEMA data without GPS position data. Waiting for GPS fix
	Green static	Valid GPS position found. GPS receiver forwarding valid NEMA data with GPS position data
FMS	Red blinking	FMS data not valid
	Green blinking	FMS data valid

LED	Status	Meaning
OBD-2	Red blinking	No valid OBD-2 data received
	Green blinking	Valid OBD-2 data received
Memory	Off	No SD card found
	Green blinking	SD card found, Log is running
DTCO	Off	No DTCO found
	Red blinking	No valid DTCO data found
	Green blinking	DTCO data valid

Note: All LEDs, except for the GPRS LED, are freely configurable. Blink patterns are fixed in the LIB.

3.2 Wake-up

If the PCAN-GPRS Link is in Sleep mode, the operation will be resumed by a wake-up signal.

Following possibilities are available for activating the PCAN-GPRS Link by a wake-up signal:

- CAN: When a message is received via CAN 1 or CAN 2, the PCAN-GPRS Link turns on. Within the wake-up time of 370 ms further incoming CAN messages are not processed.
- Clamp 15 (ignition): With a positive level on clamp 15 the PCAN-GPRS Link is set in operation. The wake-up time is also 370 ms.

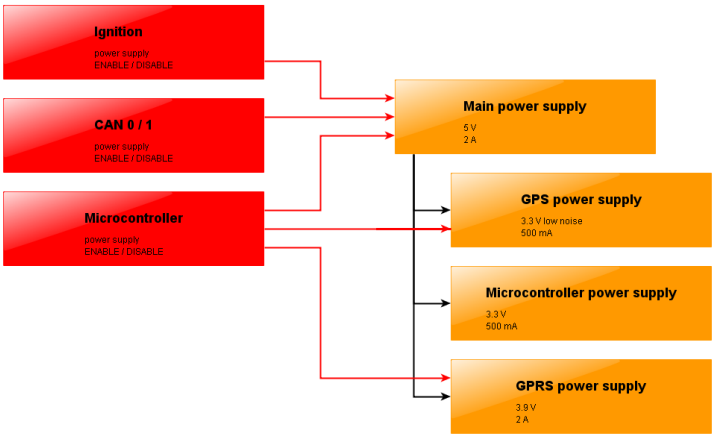


Figure 5: Power supply PCAN-GPRS Link

The PCAN-GPRS Link goes to sleep mode, if no CAN data is transmitted/received, the microcontroller is inactive, and clamp 15 is low. Activation of the PCAN-GPRS Link is in this case only possible via CAN or clamp 15.

3.3 Cabling

3.3.1 Termination

A High-speed CAN bus (ISO 11898-2) must be terminated on both ends with 120 Ohms. Otherwise, there are interfering signal reflections and the transceivers of the connected CAN nodes (CAN interface, control device) will not work.

The PCAN-GPRS Link does not have an internal termination. Use the adapter on a terminated CAN bus.

3.3.2 Example of a Connection

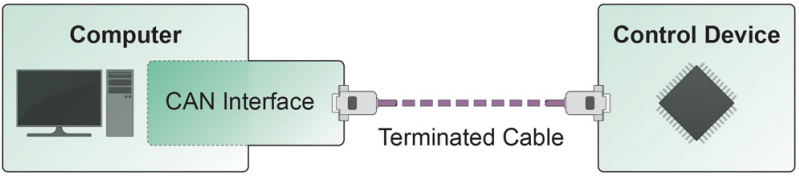


Figure 6: Simple CAN connection

In this example, the PCAN-GPRS Link is connected with a control unit by a cable that is terminated at both ends.

3.3.3 Maximum Bus Length

High-Speed-CAN networks may have bit rates of up to 1 Mbit/s. The maximum bus length depends primarily on the bit rate.

The following table shows the maximum possible CAN bus length at different bit rate:

Bit rate	Bus length
1 Mbit/s	40 m
500 kbit/s	110 m
250 kbit/s	240 m
125 kbit/s	500 m

Note: The PCAN-GPRS Link is set by default to 500 kbit/s. Only in the case of the use of FMS used standard is 250 kbit/s. All other bit rates can be used freely.

4 Transfer CAN Data via TCP/IP

The PCAN-Link software package allows the transfer of CAN data using TCP/IP. PCAN-Link is based on the CANAPI2 interface by PEAK-System, thus supporting various communication scenarios (PCAN-Link is not included in the scope of supply).

Several virtual or physical CAN networks can be connected via a network medium.

A simple PCAN-Link client can be integrated in the PCAN-GPRS Link. Note that the data rates of GPRS are 50 kbit/s in the best case.

For more information about PCAN-Link visit our website: www.peak-system.com

5 Firmware

The WinARM software provided can be used to produce your own firmware. This chapter describes the installation of the package. Furthermore, the properties for the programming of CPUs are described.

Note: You need the WinARM package only if you don't have the full version of the µVision development environment!

The ARM Evaluation Software µVision from Keil to compile the firmware can be found at:
https://www.keil.com/arm/demo/eval/arm.htm

Attention! From µVision version 4.20, there is currently no gcc support. Use the version 4.13 or less.

5.1 Installing the WinARM Package

This chapter covers the installation of the program package WinARM. Software, source code, and additional information is included on the supplied CD in the following directory branch:

`/tools`

WinARM is collection of tools to develop applications for ARM processors and microcontrollers on Windows platforms. The package includes the GNU GCC Compiler for C and C++.

The installation of the WinARM package is done in two major steps, the decompression of the ZIP archive and the setup of additional search paths under Windows.

5.1.1 Decompressing the ZIP Archive

From the supplied CD, subdirectory `tools` decompress the ZIP archive `winarm.zip` to `C:\` including all contained subdirectories. During this action the directory `C:\WinARM` and subdirectories are created.

You can get more information about the WinARM package by starting the file `readme.htm` from the installation directory `C:\WinARM`.

5.1.2 Setting up Additional Search Paths

In order to enable Windows to find the development tools on calling, the according directories must be added to the search paths (environment variable PATH):

```
C:\WinARM\bin;
```

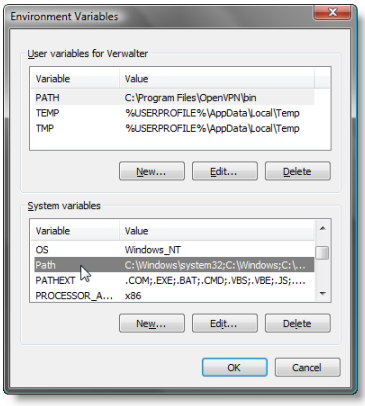
Do the following to setup the additional search paths:

1. Make sure that you are logged in as user with administrator privileges.
2. Press the key combination + Pause.

   Under Windows 2000 and XP the dialog box **System Properties** is shown, under Windows Vista and 7 the window **System**.
3. Windows Vista and 7 only: Click on **Advanced system settings**. If requested, enter an administrator password and confirm that the procedure shall be continued.

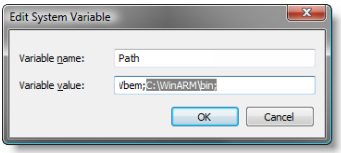
   The dialog box **System Properties** is shown.
4. Open the tab **Advanced** and on this tab click on **Environment Variables**.

   The corresponding dialog box is shown.



5. In the **System variables** click on the item **Path** and then on **Edit**.

   The dialog box **Edit System Variable** is shown.



6. Add the following character string to the allready existing contents of the field **Variable value**:

   `C:\WinARM\bin;`

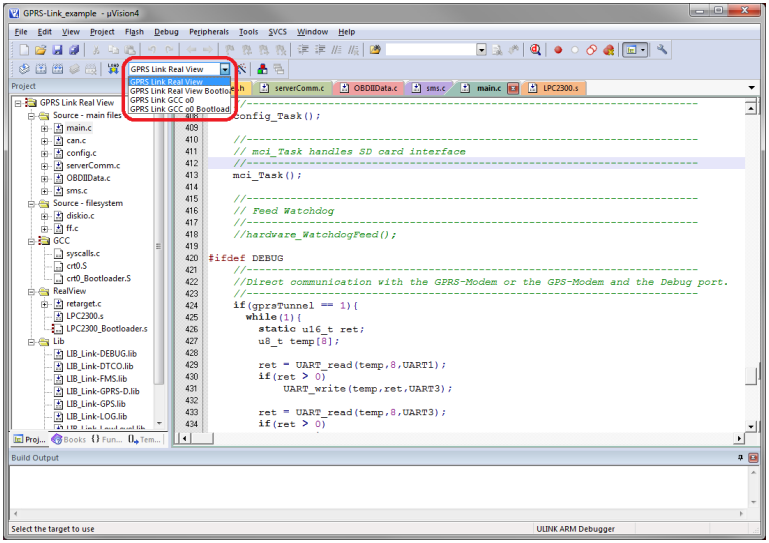
   Make sure that this character string is separated from the previous contents by a semicolon (;) and without a space.

Close this and each preceding dialog box with **OK**.

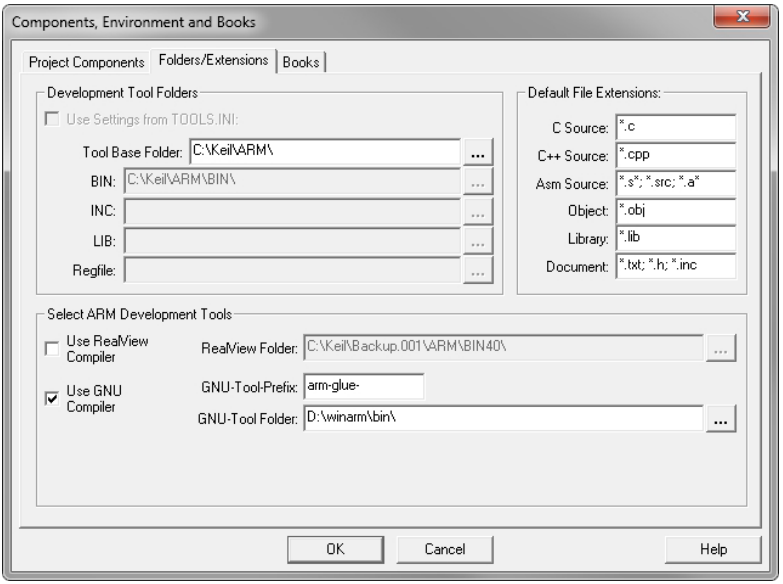
Note: The new search paths are effective only for programs and command prompts that are started afterwards.

5.2 Compiling Projects with gcc and µVision

1. Copy and unzip from the CD from the subdirectory `Firmware` the example project (PCAN-GPRS_Link_ExampleProjekt_V1.6.0.zip) to your hard disk.
2. Open the PCAN-GPRS Link project GPRS-Link_example.uvproj.
3. Select GPRS-Link GCC o0 Bootloader.



4. Open the file extensions, books, and environment and check the followings points at the tab Folders/Extensions:



Indication in the field **GNU-Tool-Prefix**: arm-glue-

Indication in the field **GNU-Tool-Folder**: the path of your winarm installtion.

Finally confirm the settings with **OK**.

5. To compile the firmware use the function key F7 or click to the button Build.

Find more information about uploading the firmware in chapter 6 *Firmware-Upload* on page 34.

Note: The generated `BIN file` is about 60% larger than the supplied file by PEAK-System. This is due to the unused optimization in gcc. Don't use this optimization, since this can lead to malfunctions of the LIB.

5.3 Microcontroller LPC2368

The microcontroller LPC2368 can be programmed freely. A demo application representing a simple telematic system is included.

Debug / Programming	
JTAG (J1)	SMD Connector 0.08 inch (2 mm)
UART (J6)	UART0, Connector 0.08 inch (2 mm)

Following libraries are available on the CD (for gcc and RealView compilers). All low-level functions are integrated in one LIB. All high-level functions are delivered in **separate** LIBs.

Low-level	
CAN	Standard CAN API by PEAK-System
UART	UART control
EEPROM	I²C control at EEPROM
MCI	MMC/SD card control
LED	LED control
RTC	Real-time clock
DMA	Use of internal DMA controllers

High-level	
FMS	Analysis of FMS data
DTCO	Analysis of DTCO data
GPS	Analysis of GPS data
OBD-2	Request and analysis of OBD-2 data
GPRS	Control of the modem and the connection to the internet
LOG	Save the data FMS, OBD-2 and GPS data in KML format (Google Earth)[1]
DEBUG	Debug output of GPRS-Link

[1] To view the GPS data in KML format, you have to install Google Earth on your computer. Make sure that you will use an appropriate license from Google for your application.

High-level	
PCAN Link	Simple PCAN-Link Client
Socket	Functions to establish a socket connection

Source code	
FAT	File system for MMC/SD card http://elm-chan.org/fsw/ff/00index_e.html

Note: All listed data can be accessed internally by data arrays.

5.3.1 JTAG Pin Assignment ARM 20-Pin Connector

With the supplied JTAG adapter you can program and reset the module (push button). Plug the supplied JTAG adapter on J1. The 0.1 inch (2,54mm) pin connector fits to all standard ARM JTAG interfaces.

Figure 7: Pin Assignment ARM 20-Pin connector

Signal	Connects to…
TMS	Test Mode State pin - Use 100 kΩ pull-up resistor to VCC
TDO	Test Data Out pin
RTCK	JTAG Return Test Clock
TDI	Test Data In pin - Use 100 kΩ pull-up resistor to VCC
TRST	Test ReSet pin - Use 100 kΩ pull-up resistor to VCC. TRST is optional and not available on some devices. You may leave it unconnected

Signal	Connects to…
TCLK	Test Clock pin - Use 100 kΩ pull-up resistor to VCC
VCC	Positive Supply Voltage - Power supply for JTAG interface drivers
GND	Digital ground
RESET	RSTIN/ pin — Connect this pin to the (low-active) reset input of the target CPU

5.3.2 FMS Data

Following data is provided through the FMS library:

PGN (hex)	Description
00FEF1	Wheel speed
00FEF1	Current status of clutch / brake / cruise control
00FEF1	Auxiliary drive (PTO)
00FEF1	Parking brake (only Bus FMS)
00F004	Engine speed
00FEE5	Engine total hours of operation
00FEE9	Fuel consumption
00F003	Accelerator pedal position 1
00FEFC	Fuel level
00FEEC	Vehicle identification number
00FDD1	FMS-standard interface
00FDD1	Diagnostic support
00FEC0	Service distance
00FEC1	High resolution total vehicle distance
00FE6C	Driver working state
00FE6C	Tachograph vehicle speed
00FEEA	Axle weight
00FEEE	Engine coolant temperature
00FE4E	Door control 1 (only Bus FMS)
00FDA5	Door control 2 (only Bus FMS)
00FEF5	Ambient Air Temperature (only Bus FMS)
00F005	Electronic transmission controller (only Bus FMS)
00FE58	Air suspension control (only Bus FMS)

PGN (hex)	Description
00FEAE	Air supply pressure (only Bus FMS)
00FEE6	Time/Date (only Bus FMS)
00FED5	Alternator status (only Bus FMS)

5.3.3 DTCO Data

The DTCO info interface allows the connection and processing of a digital tachometer with access to information about vehicle, driver identification and driver working time.

Following data is provided through the DTCO library:

No.	Description
1	Driver data
2	Driver ID
3	Speed
4	K factor (technical constant of the tachometer, specifies the input revolutions per kilometer)
5	Total kilometers
6	Trip kilometers
7	Vehicle ID
8	Ignition on/off

5.3.4 GPS Data

Following data is provided through the GPS library:

Param.	Description
latDeg	Latitude (WGS84-Koordinate)
latMin	Latitude minutes (WSG84-Koordinate)
lonDeg	Longitude (WGS84-Koordinate)
lonMin	Longitude minutes (WSG84-Koordinate)
Alti	Altitude
course	Course
speedK	Speed in km/h

Param.	Description
speedN	Speed in kn/h
satsUsed	Number of satellites used in navigation solution, 00 - 12
satsInView	Number of GPS satellites in view
Hacc	Horizontal accuracy estimate
Vacc	Vertical accuracy estimate
HDOP	Horizontal Dilution of Precision
VDOP	Vertical Dilution of Precision
TDOP	Time Dilution of Precision

5.3.5 OBD-2 via CAN

Read and reset the error codes and the Malfunction Indicator Light (MIL). The PIDs to be queried must be defined in the firmware.

Note: The complete support of all the PIDs of all vehicles can not be guaranteed.

PID (hex)	Description
0x01	System Status
0x02	DTC that caused required freeze frame data storage
0x03	Fuel system status
0x04	Calculated LOAD value
0x05	Engine Coolant Temperature
0x06, 0x08	Short Term Fuel Trim
0x07, 0x09	Long Term Fuel Trim
0x0A	Fuel Rail Pressure (gauge)
0x0B	Intake Manifold Absolute Pressure
0x0C	Engine RPM
0x0D	Vehicle Speed Sensor
0x0E	Ignition Timing Advance
0x0F	Intake Air Temperature
0x10	Air Flow Rate form Mass Air Flow Sensor
0x11	Absolute Throttle Position

PID (hex)	Description
0x12	Command Secondary Air Status
0x13, 0x1D	Location of oxygen sensors
0x14 - 0x1B	Oxygen sensor value
0x1C	OBD requirements to which vehicle or engine is certified.
0x1E	Auxiliary input status, Power take off (PTO) status
0x1F	Time since engine start
0x21	Distance traveled while MIL is activated
0x22	Fuel rail pressure relative to manifold vacuum
0x23 - 0x2B	Fuel rail pressure
0x2C	Commanded EGR
0x2D	EGR Error
0x2E	Commanded Evaporative purge
0x2F	Fuel level input
0x30	Number of warm-ups since DTCs cleared
0x31	Distance traveled since DTC cleared
0x32	Evap system vapor pressure
0x33-0x3B	Barometric pressure
0x3C - 0x3F	Catalyst Temperature Sensor
0x41	Monitor status this driving cycle
0x42	Control module voltage
0x43	Absolute load value
0x44	Fuel / Air commanded equivalence ratio
0x45	Relative throttle position
0x46	Ambient air temperature
0x47 - 0x48	Absolute throttle position
0x49 - 0x4B	Accelerator pedal position
0x4C	Commanded throttle actuator control
0x4D	Engine run time while MIL is activated
0x4E	Engine run time since DTCs cleared
0x4F - 0x50	External test equipment configuration information
0x51	Type of fuel currently being utilized by the vehicle
0x52	Alcohol fuel percentage
0x53	Absolute evap system vapor pressure

PID (hex)	Description
0x54	Evap system vapor pressure
0x55, 0x57	Short term secondary O2 sensor fuel trim
0x56, 0x58	Long term secondary O2 sensor fuel trim
0x59	Fuel rail pressure
0x5A	Relative accelerator pedal position
0x5B	Hybrid battery pack remaining life
0x5C	Engine oil temperature
0x5D	Fuel injection timing
0x5E	Engine fuel rate
0x5F	Emission requirements to which vehicle is designed
0x61	Driver's demand engine - percent torque
0x62	Actual engine - percent torque
0x63	Engine reference torque
0x64	Engine percent torque data
0x65	Auxiliary input / output supported
0x66	Mass air flow sensor
0x67	Engine coolant temperature
0x68	Intake air temperature sensor
0x69	Commanded EGR and EGR Error
0x6A	Commanded Diesel intake air flow control and relative intake air flow position
0x6B	Exhaust gas recirculation temperature
0x6C	Commanded throttle actuator control and relative throttle position
0x6D	Fuel pressure control system
0x6E	Injection pressure control system
0x6F	Turbocharger compressor inlet pressure
0x70	Boost pressure control
0x71	Variable Geometry turbo (VGT) control
0x72	Wastegate control
0x73	Exhaust pressure
0x74	Turbocharger RPM
0x75 - 0x76	Turbocharger temperature
0x77	Charge air cooler temperature (CACT)

PID (hex)	Description
0x78 - 0x79	Exhaust Gas temperature (EGT)
0x7A - 0x7B	Diesel particulate filter (DPF)
0x7C	Diesel Particulate filter (DPF) temperature
0x7D	NOx NTE control area status
0x7E	PM NTE control area status
0x7F	Engine run time
0x81 - 0x82	Engine run time for AECD
0x83	NOx sensor
0x84	Manifold surface temperature
0x85	NOx reagent system
0x86	Particulate matter (PM) sensor
0x87	Intake manifold absolute pressure
0x88 - 0xFF	ISO / SAE reserved

5.4 Wavecom Wireless CPU WMP50

The wireless CPU can be delivered fully programmed. These options are available:

- Encrypted communication over SSL only possible with WMP100. For larger values, the WMP100 can be ordered instead of the WMP50
- Unsecured communication

The wireless CPU can be reprogrammed according to your requirements. Examples are supplied.

For more information visit the Wavecom website: www.wavecom.com.

Basics	
Encoding (only WMP100)	Authentication: RSA Encoding: 3DES

Debug / Programming	
UART	UART 2-mm pin header, maximum level 3,3V

Activated Open AT Plugins	
Security (only WMP100)	Secured Sockets Layer SSL 3.0 / SSL 2.0 Jamming Detection HTTPS Crypto Library Open SIM Access
Internet	TCP/IP Stack Sockets: 8 UDP Client, 8 TCP Client, 4 TCP Server Protocols: UDP, TCP Client, TCP Server, FTP, HTTP, SMTP, POP3

6 Firmware-Upload

You can transfer the firmware on different ways to the micro-controller of the PCAN-GPRS Link.

- via the SD card (this is the recommended method)
- via firmware update over the air
- via the serial interface

6.1 Uploading the Firmware via SD Card

From the supplied CD, subdirectory `\Software and Firmware\` decompress the ZIP-Archive `PCAN-GPRS_Link_ExampleProject_Vx.x.x.zip` to `C:\` including all contained subdirectories.

The directory `C:\PCAN-GPRS_Link_ExampleProject_Vx.x.x` and all subdirectories are created.

Transfer the following files to the SD card:

- `FirmCRC.BIN`
- `crc.txt`
- `update.ini`

Note: Check the `update.ini`. Thus the update will be performed, the following string must be included in the file: **UPDATE=TRUE**.
Write everything in capital letters and put no characters before the string. Otherwise, the string will not be recognized by the boot loader.

After inserting the SD card into the PCAN-GPRS Link the module starts programming itself. Switch the module off and on again.

6.2 Firmware Update via GPRS

Using the internal boot loader, a firmware update via GPRS can be done. To keep all update options open the GPRS interface is not predefined by Peak-System. Transfer the files `FirmCRC.bin`, `crc.txt` and `update.ini` on any path onto the module so that you can use the update.

After the data is transmitted, the microcontroller writes the data to the SD card. After a reset the module will start by itself.

6.3 Uploading Firmware via the Serial Connections

This section shows how to initiate the microcontroller's boot loader. The actual upload process is done with the tool Flash Magic (on the CD in the directory `tools`), which is supplied by a third party and is not described here. You can get more details from our customer support (see address on page 2).

Attention! If you transmit the firmware with this procedure, the boot loader for the update via SD card will be overwritten

Do the following to initiate the microcontroller's boot loader:

1. Switch the PCAN-GPRS Link off by disconnecting it from the power supply.
2. Open the casing of the PCAN-GPRS Link by removing the screws in order to gain access to the board.

3. Establish a connection on the J6 connector panel between pin 4 (/Boot_ser) and pin 5 (GND).

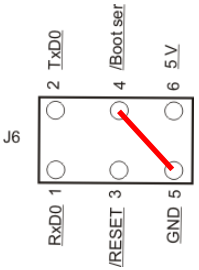


Figure 8: Connection at connector J6

4. Establish a serial connection to the computer via the serial port of the microcontroller (**attention: TTL levels**).
5. Switch the PCAN-GPRS Link on by applying a supply voltage.

   Due to the Low level on port P0.14 of the microcontroller, the PCAN-GPRS Link starts the boot loader for serial transfer.

7 Technical Specifications

CAN	
Specification	High-speed CAN ISO 11898-2 Bit rate 40 kbit/s - 1 Mbit/s
Transceiver	NXP (Philips) TJA 1041 (with wake-up function)
Termination	optional
DTCO (Digital Tacho)	
Input level	0 - 9 V DC
EEPROM	
Memory space	256 kbit
Control	I²C
Digital IN/OUT	
Inputs	2 Low- or High-active (depending on the pull-up/-down wiring)
Output	1 Low-side driver (BSP75), 500 mA, maximum reverse voltage 40 V
Internal logging memory	
Medium	SD card, maximum 2 GB
Power supply	
Supply voltage	6 - 32 V DC
Power consumption	150 mA at 12 V See also table Appendix C on page 41
Startup time	370 ms

Measure	
Board size Casing size	100 x 24 x 80 mm (W x H x D) 105 x 30 x 85 mm (W x H x D) See also dimension drawing Appendix B on page 40
Weight	70 g (only board) 270 g (with casing)

Environment	
Operating temperature	-40 - +85 °C (-40 - +185 °F)
Temperature for storage and transport	-40 - +100 °C (-40 - +212°F)
Relative humidity	15% - 90%, not condensing

Tests / approvals	
EMV	ETSI EN 301 489-1 /-3 /-7 ETSI EN 300 440 ETSI EN 301 511 DIN EN 61326-1:2013-07 DIN EN 55011:2009 EC directive 2004/108/EG Car directive 2009/19/EG
Safety requirements	DIN EN 61010-1:2011-07
Protection class (DIN EN 60529)	IP20
Type approval	E1 10 R - 03 6183

Appendix A CE-Certificate

PCAN-GPRS Link IPEH-004000 – EC Declaration of Conformity
PEAK-System Technik GmbH

Notes on the CE Symbol CE

The following applies to the "PCAN-GPRS Link" product with the item number(s) IPEH-004000.

EC Directive This product fulfills the requirements of EU EMC Directive 2004/108/EC (Electromagnetic Compatibility) and is designed for the following fields of application as for the CE marking:

Electromagnetic Immunity/Emission
DIN EN 61326-1, publication date 2013-07
Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements (IEC 61326-1:2012); German version EN 61326-1:2013

ETSI EN 301 489-1: 2011-09 (V1.9.3)
Electromagnetic compatibility and Radio spectrum Matters (ERM) - Electromagnetic Compatibility (EMC) standard for radio equipment and services - Part 1: common technical requirements

ETSI EN 301 489-3: 2013-08 (V1.6.1)
Electromagnetic compatibility and Radio spectrum Matters (ERM) - Electromagnetic Compatibility (EMC) standard for radio equipment and services - Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz

ETSI EN 301 489-7: 2005-11 (V1.3.1)
Electromagnetic compatibility and Radio spectrum Matters (ERM) - Electromagnetic Compatibility (EMC) standard for radio equipment and services - Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio telecommunications systems (GSM and DCS)

Safety requirements
DIN EN 61010-1: 2011-07
Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements (IEC 61010-1:2010 + Corrigenda:2011); German version EN 61010-1:2010

Declarations of Conformity In accordance with the above mentioned EU directives, the EC declarations of conformity and the associated documentation are held at the disposal of the competent authorities at the address below:

PEAK-System Technik GmbH
Mr. Wilhelm
Otto-Roehm-Strasse 69, 64293 Darmstadt, Germany
Phone: +49 (0)6151 8173-20, Fax: +49 (0)6151 8173-29
E-mail: info@peak-system.com

Signed this 22nd day of October 2013

Appendix B Dimension Drawing

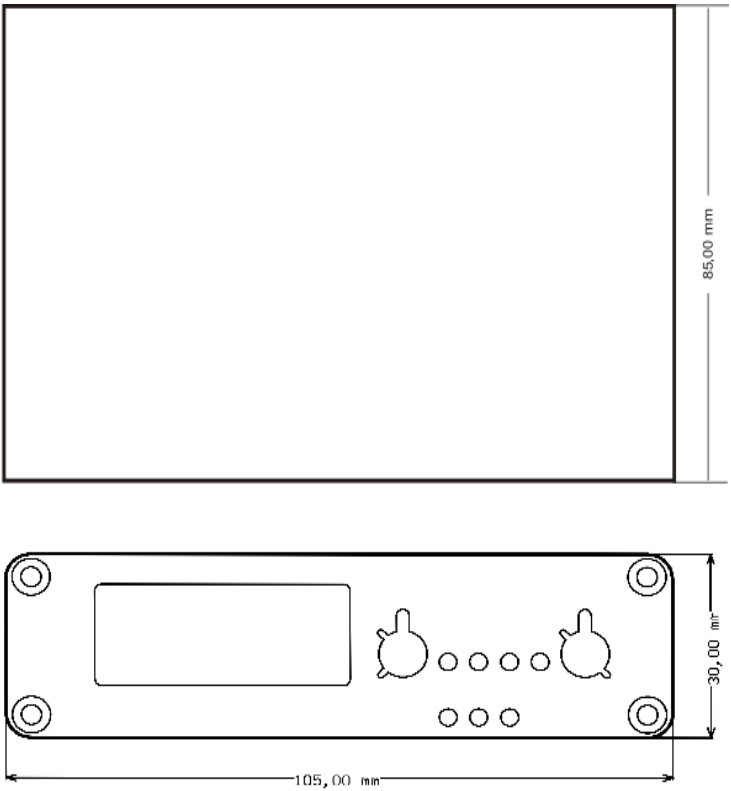


Figure 9: Top view and view of the front side.

The figure doesn't show the actual size of the product.

Appendix C Current Consumption PCAN-GPRS Link

The tables list the current consumption of the PCAN-GPRS Link. It has been rounded to whole mA.

Voltage	Power [mA]	CAN1 /CAN2	SD card	LEDs	GPS	LPC	GPRS	Comments
12 V	61	Active 0%	No card	All OFF	OFF	while(1)	OFF	
	63		No traffic		OFF			
	116				SEARCHING			
	96				TRACKING			Averaged over 60 s
	56	SLEEP			OFF			
	14					SLEEP		µC Sleep Mode, wake-up over RTC is possible
	20	Active 0%						µC Sleep Mode, wake-up over RTC is possible
	13	SLEEP				Power down		µC power down mode, wake-up over RTC is possible
	1					OFF		Power supply OFF, wake-up over CAN
	80	Active 99%				transmit CAN		

Voltage	Power [mA]	CAN1 /CAN2	SD card	LEDs	GPS	LPC	GPRS	Comments
	78	SLEEP		All on		while(1)		

Summary of current consumption:

Current at 12 V	mA
GPS, searching	53
GPS, tracking	33
Per LED	1,8
Per CAN bus, 99% busload	8,5
Per CAN bus, 0% busload	3,5
SD card standby	2
Wireless CPU(GPRS) active standby	18
Module standby	1